

IN THE CLAIMS

What is claimed is:

- 1 1. A thermal interface material, comprising:
 - 2 a polymer matrix;
 - 3 fusible particles dispersed within the polymer matrix; and
 - 4 non-fusible particles dispersed within the polymer matrix, wherein the
 - 5 fusible particles have a mean particle size that is greater than the maximum particle
 - 6 size of the non-fusible particles.
- 1 2. The thermal interface material of claim 1 wherein the polymer is a
- 2 polymer solder hybrid.
- 1 3. The thermal interface material of claim 1 wherein the mean particle
- 2 size of the fusible particles is less than or equal to about 60 microns.
- 1 4. The thermal interface material of claim 1 wherein the fusible
- 2 particles have a size effective for contacting an upper and lower surface of two
- 3 elements separated by the thermal interface material.
- 1 5. The thermal interface material of claim 1 wherein the fusible
- 2 particles consist of indium and tin.
- 1 6. The thermal interface material of claim 1 wherein the fusible
- 2 materials comprise In, Bi, Cu, Ag, Sn, Pb, Cd, Zn, Ga, Te, Hg, Tl, Sb, Se, Po, or
- 3 mixtures of any two or more thereof or alloys thereof.
- 1 7. The thermal interface material of claim 1 wherein the polymer
- 2 comprises one or more of siloxanes, olefins, and epoxies.

1 8. The thermal interface material of claim 1 wherein the polymer
2 comprises a vinyl terminated polydimethylsiloxane, a crosslinker; a platinum
3 catalyst; and an inhibitor.

1 9. An integrated circuit, comprising:
2 at least one silicon die;
3 the thermal interface material of claim 1; and
4 an integral heat spreader, wherein the thermal interface material is
5 sandwiched between the silicon die and the integral heat spreader.

1 10. The integrated circuit of claim 9, wherein the fusible particles in the
2 thermal interface material have a size effective for contacting both the integral heat
3 spreader and the silicon die.

1 11. The integrated circuit of claim 9 further comprising a heat sink and a
2 second thermal interface component, wherein the second thermal interface material
3 component is sandwiched between the integral heat spreader and the heat sink.

1 12. The integrated circuit of claim 11 wherein the second thermal
2 interface material component comprises the thermal interface material of claim 1.

1 13. The integrated circuit of claim 9 further comprising a pin grid array.

1 14. The electronic package of claim 13 wherein the form factor is a ball
2 grid array.

1 15. The electronic package of claim 13 wherein the form factor is a ball
2 grid array with pinned interposers and wire bonding.

1 16. An electronic package, comprising:
2 a heat sink;
3 a thermal heat spreader; and
4 a thermal interface material, wherein the thermal interface material is
5 sandwiched between the integral heat spreader and the heat sink.

1 17. The electronic package of claim 16, wherein the fusible particles in
2 the thermal interface material have a size effective for contacting both the heat sink
3 and the integral heat spreader.

1 18. An electronic assembly comprising the electronic package of claim 8.

1 19. An electronic assembly comprising the thermal interface material of
2 claim 1.

1 20. An electronic assembly comprising the thermal interface material of
2 claim 9.

1 21. A method for improving thermal interface material performance in
2 an integrated circuit, comprising:
3 providing a polymer capable of forming a polymer matrix;
4 blending fusible particles into the polymer, wherein the fusible particles
5 have a mean diameter; and
6 blending non-fusible filler particles into the polymer, wherein the
7 maximum particle size of the non-fusible particles is less than the mean particle size
8 of the fusible particles.

1 22. The method of claim 21, further comprising curing the polymer.

1 23. The method of claim 21, further comprising applying the thermal
2 interface material to an electronic package.

1 24. An electronic system comprising the integrated circuit of claim 9.